IGS Helper Tower Option Evaluation

Presented here is the economic evaluation of three alternate helper tower designs at IGS. No account has been taken for increased performance of the existing towers as a result of the 15% reduction in flow which will be redirected to the new helper tower. This performance improvement increment on the existing towers at this point, is unknown.

Anticipated tower outlet temperatures from the new helper towers and construction estimates for the three alternatives were provided by Marley Cooling Tower, Inc., who completed an engineering study commissioned by IPSC.

Alternative I: Two each, 4- cell helper towers operating with 15% of existing flow.
Alternative II: Two each, 4-cell helper towers operating with approximately 20-25% of existing flow. Additional 5-10% flow coming from circ pump upgrade.
Alternative III: Two each, 6-cell helper towers operating including pump upgrade as in II above.

Performance Calculation

Total Heat Duty:

The heat duty on the towers is equal under all three alternatives. Based on the IGS thermal performance model the total heat duty is as follows:
(143,650,000 lbs/hr) (28.2 F) (1 BTU/F-lb) = 4.1×10^9 *
* on a per condenser basis the heat duty is $4.1 \times 10^9 / 3 = 1350$ MBTU/hr

Design tower heat rejection (duty) conditions for each alternative are as follows:
I: (330,000 gpm) (1/.1204gal/lb) (60 min/hr) (29.6 F) (1BTU/F-lb) = 4.87×10^9
II&III: (346,500 gpm) (1/.1203gal/lb) (60 min/hr) (28.19 F) (1BTU/F-lb) = 4.87×10^9

Blended Cold Water Temperatures: (Condenser Inlet)

The curve entitled 'Blended Helper Tower', attached provides the estimated cold water temperature provided by the various tower options

Full Load Condenser Pressures:

The attached curves show estimated condenser backpressure for each individual condenser based on the calculated 1350 MBTU/hr heat rejection load shown above.

	Condenser A	Condenser B	Condenser C
Option #1	4.15" Hg	3.75" Hg	2.88" Hg
Option #2	4.05" Hg	3.65" Hg	2.83" Hg
Option #3	3.90" Hg	3.50" Hg	2.75" Hg

Performance Savings Increment:

Each 0.1 in. Hg in turbine backpressure is worth approximately $150,000 per unit per year
(See attached curve entitled 'Impact of Backpressure on Heat Rate'.)

Because condenser A is our operational limiting factor, increments of backpressure reduction in A condenser are of greatest importance. Condenser A increments line up well with the next highest pressure condenser as well. Therefore:

Option #1	Base Option
Option #2	0.1"Hg gain or $150,000/unit-year
Option #3	0.25"Hg gain or $375,000/unit-year

DRAFT MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: S. Gale Chapman

FROM: Dennis K. Killian

DATE: June 23, 1999

SUBJECT: Proposal to Improve Cooling Tower Reliability and Performance

We recommend that a project be initiated to evaluate the long-term structural integrity and justifiable performance improvement issues on our cooling towers. The continuing degradation of cooling tower concrete and long-standing generation bottleneck issues in the circulating water cooling system are the basis for this study. With your signature, we will initiate efforts to identify cost effective options for maximizing structural life and year round cooling tower performance.

We recommend investigating the following cooling tower issues:
1. Structural Integrity
2. Distribution System Degradation
3. Fill Efficiency

Cooling Tower Structural Integrity

The concrete structure of the cooling towers is showing increasing amounts of spalling and rebar corrosion. A specialist experienced in rectifying specific concrete problems can help us identify the root cause of the structural degradation and the most cost-effective method of limiting further deterioration. Concrete degradation mechanisms are such that costs to restore increase significantly with time and result in a progressively shorter remaining life of the repaired structure.

We would anticipate having a work scope and related costs for staff review, by end of this calendar year. We have prepared the attached specification for hiring a cooling tower concrete treatment consultant to ensure the most cost effective measures in maximizing cooling tower life.

Cooling Tower Distribution System Degradation

We recommend investigating improvements to our current water distribution system to eliminate existing hardware degradation.

During each outage inspection we find a percentage of the distribution nozzles and piping broken and malfunctioning. Proper design of the nozzles and distribution piping will return immediate benefits in both tower performance and maintenance costs. We believe this work is necessary to fully realize the existing performance capacity of our towers. We estimate this work will save $???? annually.

We anticipate that a recommendation on redesign of the water distribution system should be available for staff review by the end of the current calendar year.

Cooling Tower Fill Efficiency

In recent years, cooling tower fill technology has experienced significant advances. There is substantial reason to expect that changing from the original ceramic fill to a newer design film fill will reduce the required air flow and fan power, and improve air distribution for better overall cooling capacity and efficiency. We plan to involve counter-flow tower specialists to ensure the existing air flow distribution concerns are accounted for within the design, testing and operational warranty provisions.

Complete analysis of the existing air flow and tower fill alternatives may extend beyond the current calendar year. If approved by staff, replacement of the tower fill will be coordinated with the water distribution system modifications to minimize labor requirements.

We estimate the returns for this option will save $???? annually.

Each of the three areas will be developed with specific testing methods to verify that the guaranteed performance is achieved. Please sign the attached requisition to engage a proven concrete consultant to assist us proceeding with the first item.

CDJ/JHN: